

WHAT IS CLAIMED IS:

1. A device having at least one liquid crystal panel, said liquid crystal panel comprising:

a substrate having an insulating surface;

at least one thin film transistor formed over said substrate, said thin film transistor including at least a channel region, source and drain regions with said channel region therebetween, a gate insulating film adjacent to said channel region, and a gate electrode adjacent to said channel region with said gate insulating film interposed therebetween;

an organic resin film formed over said substrate to provide a leveled upper surface over said substrate, said organic resin film covering said thin film transistor; and

a pixel electrode formed over said organic resin film, said pixel electrode being electrically connected to said thin film transistor through an opening formed in said organic resin film,

wherein said channel region comprises crystal silicon and exhibits a peak of Raman spectra displaced from 522 cm^{-1} to the low frequency direction. (Device + Raman shift)

2. A device having at least one liquid crystal panel, said liquid crystal panel comprising:

a substrate having an insulating surface;

at least one thin film transistor formed over said substrate, said thin film transistor including at least a channel region, source and drain regions with said channel region therebetween, a gate insulating film

adjacent to said channel region, and a gate electrode adjacent to said channel region with said gate insulating film interposed therebetween;

an organic rein film formed over said substrate to provide a leveled upper surface over said substrate, said organic resin film covering said thin film transistor; and

a pixel electrode formed over said organic resin film, said pixel electrode being electrically connected to said thin film transistor through an opening formed in said organic resin film,

wherein said channel region comprises crystal silicon and exhibits a peak of Raman spectra displaced from 522 cm^{-1} to the low frequency direction and said channel region contains boron at a concentration of 1×10^{15} to 1×10^{18} atoms/cm³. (1 + boron concentration)

3. A device having at least one liquid crystal panel, said liquid crystal panel comprising:

a substrate having an insulating surface;

at least one thin film transistor formed over said substrate, said thin film transistor including at least a channel region, source and drain regions with said channel region therebetween, a gate insulating film adjacent to said channel region, and a gate electrode adjacent to said channel region with said gate insulating film interposed therebetween;

an organic rein film formed over said substrate to provide a leveled upper surface over said substrate, said organic resin film covering said thin film transistor; and

a pixel electrode formed over said organic resin film, said pixel electrode being electrically connected to said thin film transistor through an opening formed in said organic resin film,

wherein said channel region comprises crystal silicon and exhibits a peak of Raman spectra displaced from 522 cm^{-1} to the low frequency direction and said channel region contains oxygen at a concentration not higher than 7×10^{19} atoms/cm³. (1 + oxygen concentration, support for oxygen concentration is page 20, line 19)

4. A device having at least one liquid crystal panel, said liquid crystal panel comprising:

a substrate having an insulating surface;

at least one thin film transistor formed over said substrate, said thin film transistor including at least a channel region, source and drain regions with said channel region therebetween, a gate insulating film adjacent to said channel region, and a gate electrode adjacent to said channel region with said gate insulating film interposed therebetween;

an interlayer insulating film covering said thin film transistor;

a lead electrode comprising aluminum formed on said interlayer insulating film and electrically connected to one of the source or drain regions of said thin film transistor through a hole of said interlayer insulating film;

an organic resin film formed over thin film transistor, said interlayer insulating film and said lead electrode to provide a leveled upper surface; and

a pixel electrode formed over said organic resin film, said pixel electrode being electrically connected to said thin film transistor via said lead electrode,

wherein said channel region comprises crystal silicon and exhibits a peak of Raman spectra displaced from 522 cm^{-1} to the low frequency direction. (1 + lead electrode comprising aluminum)

5. A device having at least one liquid crystal panel, said liquid crystal panel comprising:

a substrate having an insulating surface,

at least one thin film transistor formed over said substrate,
said thin film transistor including at least a channel region, source and drain
regions with said channel region therebetween, a gate insulating film
adjacent to said channel region, and a gate electrode adjacent to said
channel region with said gate insulating film interposed therebetween;

an organic resin film formed over said substrate to provide a
10 leveled upper surface over said substrate, said organic resin film covering
said thin film transistor; and

a pixel electrode formed over said organic resin film, said pixel electrode being electrically connected to said thin film transistor through an opening formed in said organic resin film,

15 wherein said channel region comprises crystal silicon of which
apparent grain diameter calculated based on half-width of Raman spectra
is 50 to 500Å. (1 + Raman grain size)

6. A television comprising:

a tuner for receiving television radio wave;

20 a liquid crystal panel operationally connected to said tuner,
said liquid crystal panel comprising:

a substrate having an insulating surface;

at least one thin film transistor formed over said substrate, said thin film transistor including at least a channel region, source and drain regions with said channel region therebetween, a gate insulating film adjacent to said channel region, and a gate electrode adjacent to said channel region with said gate insulating film interposed therebetween;

an organic resin film formed over said substrate to provide a leveled upper surface over said substrate, said organic resin film covering said thin film transistor; and

5 a pixel electrode formed over said organic resin film, said pixel electrode being electrically connected to said thin film transistor through an opening formed in said organic resin film,

wherein said channel region comprises crystal silicon and exhibits a peak of Raman spectra displaced from 522 cm^{-1} to the low frequency direction. (TV + Raman shift)

10 7. A television comprising:

a tuner for receiving television radio wave;

a liquid crystal panel operationally connected to said tuner, said liquid crystal panel comprising:

a substrate having an insulating surface;

15 at least one thin film transistor formed over said substrate, said thin film transistor including at least a channel region, source and drain regions with said channel region therebetween, a gate insulating film adjacent to said channel region, and a gate electrode adjacent to said channel region with said gate insulating film interposed therebetween;

20 an organic resin film formed over said substrate to provide a leveled upper surface over said substrate, said organic resin film covering said thin film transistor; and

25 a pixel electrode formed over said organic resin film, said pixel electrode being electrically connected to said thin film transistor through an opening formed in said organic resin film,

wherein said channel region comprises crystal silicon and exhibits a peak of Raman spectra displaced from 522 cm^{-1} to the low

frequency direction and said channel region contains boron at a concentration of 1×10^{15} to 1×10^{18} atoms/cm³. (6 + boron concentration)

8. A television comprising:

a tuner for receiving television radio wave;

5 a liquid crystal panel operationally connected to said tuner, said liquid crystal panel comprising:

a substrate having an insulating surface;

10 at least one thin film transistor formed over said substrate, said thin film transistor including at least a channel region, source and drain regions with said channel region therebetween, a gate insulating film adjacent to said channel region, and a gate electrode adjacent to said channel region with said gate insulating film interposed therebetween;

15 an organic resin film formed over said substrate to provide a leveled upper surface over said substrate, said organic resin film covering said thin film transistor; and

a pixel electrode formed over said organic resin film, said pixel electrode being electrically connected to said thin film transistor through an opening formed in said organic resin film,

20 wherein said channel region comprises crystal silicon and exhibits a peak of Raman spectra displaced from 522 cm^{-1} to the low frequency direction and said channel region contains oxygen at a concentration not higher than 7×10^{19} atoms/cm³. (6+ oxygen concentration)

9. A television comprising:

a tuner for receiving television radio wave;

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a liquid crystal panel operationally connected to said tuner,
said liquid crystal panel comprising:

a substrate having an insulating surface;

at least one thin film transistor formed over said substrate,
said thin film transistor including at least a channel region, source and drain
5 regions with said channel region therebetween, a gate insulating film
adjacent to said channel region, and a gate electrode adjacent to said
channel region with said gate insulating film interposed therebetween;

an interlayer insulating film covering said thin film transistor;

10 a lead electrode comprising aluminum formed on said interlayer insulating film and electrically connected to one of the source or drain regions of said thin film transistor through a hole of said interlayer insulating film;

15 an organic rein film formed over thin film transistor, said interlayer insulating film and said lead electrode to provide a leveled upper surface; and

a pixel electrode formed over said organic resin film, said pixel electrode being electrically connected to said thin film transistor via said lead electrode,

20 wherein said channel region comprises crystal silicon and exhibits a peak of Raman spectra displaced from 522 cm^{-1} to the low frequency direction. (6 + lead electrode comprising aluminum)

10. A television comprising:

a tuner for receiving television radio wave;

25 a liquid crystal panel operationally connected to said tuner,
said liquid crystal panel comprising:

a substrate having an insulating surface;

at least one thin film transistor formed over said substrate,
said thin film transistor including at least a channel region, source and drain
regions with said channel region therebetween, a gate insulating film
adjacent to said channel region, and a gate electrode adjacent to said
5 channel region with said gate insulating film interposed therebetween;

an organic rein film formed over said substrate to provide a
leveled upper surface over said substrate, said organic resin film covering
said thin film transistor; and

a pixel electrode formed over said organic resin film, said
10 pixel electrode being electrically connected to said thin film transistor
through an opening formed in said organic resin film,

wherein said channel region comprises crystal silicon of which
apparent grain diameter calculated based on half-width of Raman spectra
is 50 to 500Å. (6 + Raman grain size)

11. A portable computer having a liquid crystal panel, said liquid
15 crystal panel comprising:

a substrate having an insulating surface;

at least one thin film transistor formed over said substrate,
said thin film transistor including at least a channel region, source and drain
20 regions with said channel region therebetween, a gate insulating film
adjacent to said channel region, and a gate electrode adjacent to said
channel region with said gate insulating film interposed therebetween;

an organic rein film formed over said substrate to provide a
leveled upper surface over said substrate, said organic resin film covering
25 said thin film transistor; and

a pixel electrode formed over said organic resin film, said pixel electrode being electrically connected to said thin film transistor through an opening formed in said organic resin film,

5 wherein said channel region comprises crystal silicon and exhibits a peak of Raman spectra displaced from 522 cm^{-1} to the low frequency direction. (portable computer + Raman shift)

12. A portable computer having a liquid crystal panel, said liquid crystal panel comprising:

a substrate having an insulating surface;

10 at least one thin film transistor formed over said substrate, said thin film transistor including at least a channel region, source and drain regions with said channel region therebetween, a gate insulating film adjacent to said channel region, and a gate electrode adjacent to said channel region with said gate insulating film interposed therebetween;

15 an organic resin film formed over said substrate to provide a leveled upper surface over said substrate, said organic resin film covering said thin film transistor; and

20 a pixel electrode formed over said organic resin film, said pixel electrode being electrically connected to said thin film transistor through an opening formed in said organic resin film,

wherein said channel region comprises crystal silicon and exhibits a peak of Raman spectra displaced from 522 cm^{-1} to the low frequency direction and said channel region contains boron at a concentration of 1×10^{15} to 1×10^{18} atoms/cm³. (11 + boron concentration)

25 13. A portable computer having a liquid crystal panel, said liquid crystal panel comprising:

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5 a substrate having an insulating surface;
at least one thin film transistor formed over said substrate,
said thin film transistor including at least a channel region, source and drain
regions with said channel region therebetween, a gate insulating film
adjacent to said channel region, and a gate electrode adjacent to said
channel region with said gate insulating film interposed therebetween;
an organic resin film formed over said substrate to provide a
leveled upper surface over said substrate, said organic resin film covering
said thin film transistor; and
10 a pixel electrode formed over said organic resin film, said
pixel electrode being electrically connected to said thin film transistor
through an opening formed in said organic resin film,
wherein said channel region comprises crystal silicon and
15 exhibits a peak of Raman spectra displaced from 522 cm^{-1} to the low
frequency direction and said channel region contains oxygen at a
concentration not higher than $7 \times 10^{19}\text{ atoms/cm}^3$. (11 + oxygen
concentration, support for oxygen concentration is page 20, line 19)

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14. A portable computer having a liquid crystal panel, said liquid
crystal panel comprising:
a substrate having an insulating surface;
at least one thin film transistor formed over said substrate,
said thin film transistor including at least a channel region, source and drain
regions with said channel region therebetween, a gate insulating film
adjacent to said channel region, and a gate electrode adjacent to said
channel region with said gate insulating film interposed therebetween;
25 an interlayer insulating film covering said thin film transistor;

a lead electrode comprising aluminum formed on said interlayer insulating film and electrically connected to one of the source or drain regions of said thin film transistor through a hole of said interlayer insulating film;

5 an organic resin film formed over thin film transistor, said interlayer insulating film and said lead electrode to provide a leveled upper surface; and

a pixel electrode formed over said organic resin film, said pixel electrode being electrically connected to said thin film transistor via said lead electrode,

10 wherein said channel region comprises crystal silicon and exhibits a peak of Raman spectra displaced from 522 cm^{-1} to the low frequency direction. (11 + lead electrode comprising aluminum)

15 15. A portable computer having a liquid crystal panel, said liquid crystal panel comprising:

a substrate having an insulating surface;

20 at least one thin film transistor formed over said substrate, said thin film transistor including at least a channel region, source and drain regions with said channel region therebetween, a gate insulating film adjacent to said channel region, and a gate electrode adjacent to said channel region with said gate insulating film interposed therebetween;

an organic resin film formed over said substrate to provide a leveled upper surface over said substrate, said organic resin film covering said thin film transistor; and

25 a pixel electrode formed over said organic resin film, said pixel electrode being electrically connected to said thin film transistor through an opening formed in said organic resin film,

wherein said channel region comprises crystal silicon of which apparent grain diameter calculated based on half-width of Raman spectra is 50 to 500Å. (11 + Raman grain size)

- 5 16. A device computer having a liquid crystal panel, said liquid crystal panel comprising:
- a first substrate having an insulating surface;
 - at least one thin film transistor formed over said substrate, said thin film transistor including at least a channel region, source and drain regions with said channel region therebetween, a gate insulating film adjacent to said channel region, and a gate electrode adjacent to said channel region with said gate insulating film interposed therebetween;
 - an organic rein film formed over said substrate to provide a leveled upper surface over said substrate, said organic resin film covering said thin film transistor;
 - 15 a pixel electrode formed over said organic resin film, said pixel electrode being electrically connected to said thin film transistor through an opening formed in said organic resin film;
 - a second substrate opposed to said first substrate with a liquid crystal material interposed therebetween;
 - 20 a black stripe formed on said second substrate;
 - an organic leveling film covering said color filter over said second substrate;
 - a transparent conductive film formed on said organic leveling film; and
 - 25 an orientation film formed on said transparent conductive film.
17. A television comprising:

a tuner for receiving television radio wave;

a liquid crystal panel operationally connected to said tuner,
said liquid crystal panel comprising:

a first substrate having an insulating surface;

5 at least one thin film transistor formed over said substrate,
said thin film transistor including at least a channel region, source and drain
regions with said channel region therebetween, a gate insulating film
adjacent to said channel region, and a gate electrode adjacent to said
channel region with said gate insulating film interposed therebetween;

10 an organic resin film formed over said substrate to provide a
leveled upper surface over said substrate, said organic resin film covering
said thin film transistor;

a pixel electrode formed over said organic resin film, said
pixel electrode being electrically connected to said thin film transistor
15 through an opening formed in said organic resin film;

a second substrate opposed to said first substrate with a liquid
crystal material interposed therebetween;

a black stripe formed on said second substrate;

20 an organic leveling film covering said color filter over said
second substrate;

a transparent conductive film formed on said organic leveling
film; and

an orientation film formed on said transparent conductive film.

18. A device having at least one flat panel display, said flat panel
25 display comprising:

a substrate having an insulating surface;

at least one thin film transistor formed over said substrate, said thin film transistor including at least a channel region, source and drain regions with said channel region therebetween, a gate insulating film adjacent to said channel region, and a gate electrode adjacent to said channel region with said gate insulating film interposed therebetween;

an organic resin film formed over said substrate to provide a leveled upper surface over said substrate, said organic resin film covering said thin film transistor; and

10 a pixel electrode formed over said organic resin film, said pixel electrode being electrically connected to said thin film transistor through an opening formed in said organic resin film,

wherein said channel region comprises crystal silicon and exhibits a peak of Raman spectra displaced from 522 cm^{-1} to the low frequency direction. (1 - LCD)

15 19. A device having at least one flat panel display, said flat panel
display comprising:

a substrate having an insulating surface;

at least one thin film transistor formed over said substrate, said thin film transistor including at least a channel region, source and drain regions with said channel region therebetween, a gate insulating film adjacent to said channel region, and a gate electrode adjacent to said channel region with said gate insulating film interposed therebetween;

an organic resin film formed over said substrate to provide a leveled upper surface over said substrate, said organic resin film covering said thin film transistor; and

a pixel electrode formed over said organic resin film, said pixel electrode being electrically connected to said thin film transistor through an opening formed in said organic resin film,

5 wherein said channel region comprises crystal silicon and exhibits a peak of Raman spectra displaced from 522 cm^{-1} to the low frequency direction and said channel region contains boron at a concentration of 1×10^{15} to 1×10^{18} atoms/cm³. (2- LCD)

20. A device having at least one flat panel display, said flat panel display comprising:

a substrate having an insulating surface;

at least one thin film transistor formed over said substrate, said thin film transistor including at least a channel region, source and drain regions with said channel region therebetween, a gate insulating film adjacent to said channel region, and a gate electrode adjacent to said channel region with said gate insulating film interposed therebetween;

15 an interlayer insulating film covering said thin film transistor;

a lead electrode comprising aluminum formed on said interlayer insulating film and electrically connected to one of the source or drain regions of said thin film transistor through a hole of said interlayer insulating film;

20 an organic resin film formed over thin film transistor, said interlayer insulating film and said lead electrode to provide a leveled upper surface; and

25 a pixel electrode formed over said organic resin film, said pixel electrode being electrically connected to said thin film transistor via said lead electrode,

wherein said channel region comprises crystal silicon and exhibits a peak of Raman spectra displaced from 522 cm^{-1} to the low frequency direction. (4- LCD)

5 21. A portable computer having at least one flat panel display, said flat panel display comprising:

a substrate having an insulating surface;

10 at least one thin film transistor formed over said substrate, said thin film transistor including at least a channel region, source and drain regions with said channel region therebetween, a gate insulating film adjacent to said channel region, and a gate electrode adjacent to said channel region with said gate insulating film interposed therebetween;

an organic rein film formed over said substrate to provide a leveled upper surface over said substrate, said organic resin film covering said thin film transistor; and

15 a pixel electrode formed over said organic resin film, said pixel electrode being electrically connected to said thin film transistor through an opening formed in said organic resin film,

20 wherein said channel region comprises crystal silicon and exhibits a peak of Raman spectra displaced from 522 cm^{-1} to the low frequency direction and said channel region contains boron at a concentration of 1×10^{15} to 1×10^{18} atoms/cm³. (12- LCD)

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